

Managing Students' Math-Anxiety Through Humanistic Mathematics Education

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Abstract

Prior to the national examination, there are many students and/or their parents often anxious excessively. Especially for math class, students often feel anxious not only at the time of the exam, but also long before the exam. Actually, not all anxiety is bad. Anxiety, within certain limits, can be managed so that it will turn into an intrinsic motivation that can help students perform better.

There are several reasons why students have anxiety about math. One of the reasons is an authoritarian teacher. Another reason of anxiety for students to learn mathematics is from the students themselves, such as low self-esteem or lack of confidence. Low self-esteem or lack of confidence can be generated by previous negative experiences when they learned mathematics.

There are many studies showing a negative correlation between mathematics anxiety and mathematics learning achievement. The question then is: what can be done by a math teacher to help students manage their anxiety? One possible way, teachers can help students to manage their anxiety by implementing humanistic teaching and learning. This paper will discuss how to manage the anxiety of students in learning mathematics through a humanistic mathematics education.

Key words: math-anxiety, humanistic mathematics education.

I. INTRODUCTION

Prior to the national examination, there are many students, or their parents, or both, who often feel anxious excessively, worrying whether the students will be successful in the exam or not. Excessive anxiety is unfortunate, because it can make the students unable to concentrate during the exam, or even worse, it can cause the students to get sick. A little anxiety about exam was reasonable, but if it is excessive, it should be taken care of.

In the case of math class, students are often anxious not only at the time of the exam, but also long before the exam. Sometimes students are anxious about math lessons for many things. For example, students are anxious to meet the teacher because they did not do the homework, students are anxious if the homework they did is wrong, students are anxious if they are asked questions from the teachers, students are anxious if they cannot recall specific mathematical formula, students are anxious if they are unable to draw the correct geometric shapes, students are anxious if they do not understand what is explained by the teacher, students are anxious when asked to do the

problems in front of the class, students are anxious to be scolded by the teacher, student anxious if the teacher suddenly administer a quiz or a test, and so on.

Actually, not all anxiety is bad. Anxiety, within certain limits, can be managed so that it will turn into an intrinsic motivation that can help the students perform better. The question is: what can be done by a math teacher to help the students manage their anxiety? One possible answer is that teachers can help students to manage their anxiety by implementing a humanist learning mathematics. After all, what causes many students anxious about math is most likely due to the negative experiences they had when they were studying mathematics.

Therefore, it is the task of mathematics teachers to implement the teaching and learning method that can minimize the anxiety of students. One way is by implementing humanistic mathematics learning, i.e. learning that can manage the anxiety of students in learning mathematics. What is the meaning of the humanistic mathematics learning? Why is learning math that is humanist believed to be able to help students manage their anxiety?

This paper will discuss how to manage the anxiety of students in learning mathematics through a humanistic mathematics education. There are three sub-topics to be discussed, namely: (1) the anxiety of students in learning mathematics, (2) humanistic mathematics education, and (3) the management of student's anxiety in learning mathematics.

II. DISCUSSION

1. Students' Anxiety in Learning Mathematics

Mathematics education experts have long assumed that the affective factors are as important as the cognitive factors in teaching and learning mathematics. According to McLeod (1992), "A variety of large-scale studies provide a substantial amount of data that indicate there is good reason to be concerned about affective factors." One among the many factors considered to influence the affective student learning outcomes in mathematics is anxiety (Chamberlin, 2010). Anxiety is an affective factor that should be considered in the teaching-learning process because it has correlation with learning achievement.

Anxiety has many definitions. Sometimes it is interpreted similar to panic or fear. As Hart (McLeod, 1992) point out, "Anxiety has sometimes been characterized as fear,

a “hot” emotion, and sometimes as dislike, an attitude.” More specifically, Rubinsten and Tannock (2010) state, "Math anxiety, defined as a negative affective response to mathematics". While Warren (Strawderman, 2011) describes anxiety as "an adverse reaction to mathematics." Richardson and Suinn define mathematics anxiety as “feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations” (Peker, 2009).

There are several reasons why students have anxiety about math. Skemp (1971) mentions one of the reasons is an authoritarian teacher. Authoritarian teacher who is likely to impose his will to the students. Authoritarian teacher can make students feel uncomfortable, or even frightened, in the classroom. However, the authoritarian teacher may now not as much earlier times.

Another reason of anxiety for students to learn mathematics is from the students themselves, such as their low self-esteem or lack of confidence. Low self-esteem or a lack of confidence can be influenced by previous negative or bad experiences when they learned mathematics (Fulya, 2008). For example, students may have such a bad experience as when they got a zero score in a test, got scolded by the teachers, scolded by their parents at home, or laughed at by their friends. Feelings of inferiority can also be experienced by the students because they consider themselves not smart or talented in mathematics.

There are several symptoms that may indicate whether a student is anxious or not when s/he is following a math lesson or when s/he is taking a math test. In general, the anxiety may be accompanied by a variety of physical symptoms, such as headache, stomach ache, diarrhea, need to urinate, sweat a lot, temporary inability to hear, stammering speech, or bursting into tears. More specifically, symptoms of math anxiety on a student can cause him/her to forget all the formulas, make him/her slow to do the calculations, or unable to answer any questions from the teacher even though the questions are actually the easy ones.

What are the consequences of the students' anxiety disorder on math lessons? There are many studies showing a negative correlation between anxiety toward mathematics and mathematics learning achievement (Rubinsten and Tannock, 2010). This means that the more anxious a student, the lower academic achievement s/e will

get. Khatoon & Mahmood (2010) find a significant negative correlation ($r = - 0.48$) between math anxiety and math achievement. Zakaria and Nordin (2008) also reveal a low ($r = - 0.32$) but significant ($p < 0.05$) negative correlation between mathematics anxiety and achievement and also a strong ($r = - 0.72$) significant ($p < 0.05$) negative correlation between mathematics anxiety and motivation. The Karimi and Venkatesan research results (2009) show that mathematics anxiety has significant negative correlation with mathematics performance. Sherman and Wither (2003) examined the causal relationship between math anxiety and math learning achievement. They state that “...the data do not support the hypothesis that mathematical anxiety causes a lack of mathematical achievement, but that either the lack of mathematical achievement causes mathematical anxiety, or there is a third factor which causes both.”

Paying attention to the negative relationship between math-anxiety and mathematics achievement as mentioned above, mathematics teachers should put serious consideration to this problem. Giving a little anxiety to the students might be needed, but before that a teacher must be prepared to anticipate the variety of possible responses from students.

2. Humanistic Mathematics Education

One of the key figures in the humanistic learning theory is Carl Rogers. According to Rogers (Patterson, 1977) there are two kinds of learning, namely rote-learning and experiential-learning. Most learning happens in the class is rote learning. On this kind of learning, the material has no personal meaning for the student, does not involve feelings or the personal emotion. Experiential-learning, on the other hand, is the type of learning which makes a difference to the person in behavior, attitude, and personality. It is learning which leads to the individual becoming a more fully functioning person. Such learning involves certain principles which relate to the theory of human nature and human behavior.

Rogers abstracted a number of principles in learning (Zimring, 1999). These principles are: (1) Human beings have a natural potential for learning; (2) Significant learning takes place when the subject matter is perceived by the student as having relevance to his/her own purposes; (3) Learning which involves a change in self-organization—in the perception of oneself—is threatening and tends to be resisted; (4) Those learning which are threatening to the self are more easily perceived and

assimilated when external threats are at a minimum; (5) When the threat to the self is low, experience can be perceived in differentiated fashion and learning can proceed; (6) Much significant learning is acquired through doing; (7) Learning is facilitated when the student participates responsibly in the learning process; (8) Self-initiated learning which involves the whole person of the learner —feeling as well as intellect—is the most lasting and pervasive; (9) Independence, creativity, and self-reliance are all facilitated when self-criticism and self-evaluation are basic and evaluation by others is of secondary importance; (10) The most socially useful learning in the modern world is the learning of the process of learning, a continuing openness to experience and to incorporate into oneself the process of change.

Noting the principles of learning by Rogers above, it can be concluded that basically in the process of learning the most important thing is the involvement of students in a responsible and thorough learning process in both cognitive and affective aspects. Therefore, in a process of teaching and learning, affective aspects need attention as well, and these aspects are as important as the cognitive aspects, so that there is a change in students as a result of their learning.

In general, learning is a process of interaction which involves students, teachers, learning resources, and specific learning environment. Learning can also be interpreted as the educational assistance provided by the educators to the students so that they can learn the material well. In order to provide assistance as needed by every learner, an educator must understand the needs of individual learners.

In reality, the needs of learners are neither singular nor simple. While the basic needs are the same, as the need for safety, need for comfort, need for attention, and need for values, it is actually not the same level for every need. Therefore, it should be the teachers, especially teachers of mathematics, who must pay attention to the type and level of needs of every student in his/her class. Humanistic mathematics learning is expected to facilitate the needs of various students.

In principle, a humanistic mathematics education is mathematics education that takes into account the human sides of all educational actors. These sides are the involvement of human brain and emotions in each learning activity while considering that every man is unique. Therefore, mathematics teachers must always pay attention to the diversity of their students. Also, math teachers are required to implement the

teaching and learning of mathematics that is able to humanize human beings.

According Tennant, (<http://vismath8.tripod.com/tennant1/>), “Humanistic mathematics is a philosophy of teaching and learning which attempts to explore the human side of mathematical thought and to guide students to discover the beauty of mathematics.” Through humanistic mathematics learning, students are introduced to mathematics in ways that they can receive. Math teachers are required to carry out the learning that makes every student feel comfortable, happy, and feel the need for math, but at the same time they also feel challenged to learn mathematics. It is important to provide challenges to students because the presence of the challenge will stimulate students to think harder. However, teachers must be careful with the challenges that they gave. The challenge must not be too complicated so that it can still be carried out by the students. Otherwise, it would make the students anxious in math class, and disturb the learning spirit.

Quoting Haglund, Siswono (2007) states there are 10 kinds of the characteristics of humanistic learning mathematics, namely: (1) Placing a student as an inquirer instead of just receiving facts and procedures, (2) Giving students the opportunity to help each other in understanding the problem and more in-depth solution, (3) Learning various ways to solve the problems, not only with the algebraic approach, (4) Demonstrating the historical background of mathematics as an invention or from a human endeavor, (5) Using issues of interest and open questions (open-ended problems) in the exercises, (6) Using a variety of valuation techniques, not only assessing students based on their ability to recall procedures alone; (7) Developing an understanding and appreciation of the great mathematical ideas that shape history and culture; (8) Helping students see mathematics as a study of patterns, including the aspects of beauty and creativity; (9) Helping students develop attitudes of confident, independent, and curious, and (10) Teaching materials that can be used in everyday life, such as in science, business, economics, or engineering.

From the characteristics of humanistic learning mathematics as expressed by Haglund above, it is known that learning will take place in humanistic learning when it is able to treat students as human beings, that human beings can learn, can find something, can solve the problem, can work together, and can appreciate the beauty and usefulness of mathematics. Of course such a humanistic learning is not easy. The

teachers should really get to know their students, prepare what materials to learn, and plan a learning scenario in detail.

Since each student can learn and work together with one another, then the teacher should provide an opportunity for it, for example by giving group assignments and require students to discuss. Since each student has the potential to find something, then the math should not be given to students entirely in the form of ready-made materials. There are certain parts that could be handed over to the students to "find something".

Since each student has the ability to solve problems, although the speed and level may vary, it is the duty of teachers to provide troubleshooting problems that can be used as a means for students to learn to solve problems. Since each student can appreciate the beauty and usefulness of mathematics, the mathematics teachers must often show its beauty and usefulness to students, for example as part of the motivation at the beginning of the lesson.

It would be better for mathematics teachers if they could identify students who experience anxiety in the classroom, to explore what causes the anxiety, and then provide assistance as needed. Humanistic learning will make the teacher-student relationships and student-student relationship very harmonious. With a harmonious relationship, each student will enthusiastically welcome their math lessons. Thus, there will be no excessive anxiety. Without excessive anxiety, it can be expected that the students' performance can be further optimized. Recognizing the differences in each individual, then the teacher of mathematics should not require all students to learn mathematics with the same speed, method, and comprehension. Teachers of mathematics must always remember that their duty is to guarantee the right of every student to be able to learn optimally in an atmosphere that does not make the students anxious too much. The study result by Mora and Pinto (2003) indicates the usefulness of these humanistic activities as key elements in fostering the type of meaningful contextual interaction that promotes high motivation and selective attention.

3. Management of Students' Anxiety in Learning Mathematics

Basically, in learning mathematics students need to get a challenge to grow its ability to think critically and creatively. The teachers can design variety of tasks, which will be completed independently or as a group, and which contains a challenge for the students. Because most students have a humane tendency or interest to learn something

meaningful to him/her, then the tasks assigned by the teacher should be meaningful tasks. The teachers can use the Contextual or Realistic approach to design tasks that are meaningful.

In order for the learning process that takes place can reduce the student's math anxiety, the meaningful tasks should also be stratified. If it is identified that a student or a group of students begin feel uncomfortable with the math lesson, the teacher must be able to intervene on time and on target. To be able to intervene in a suitable time and well targeted, a teacher really needs to hone its sensitivity in observing students who are studying. A sensitive teacher will know when and to whom s/he must give assistance or guidance.

In essence, to be able to manage the students' anxiety well, a teacher must be ready to challenge but also ready to provide assistance. Assistance should be on time and targeted, because otherwise, it will make the class uncomfortable for some students. To add more the convenience of students in learning mathematics, teachers must be able to demonstrate to the students the beauty of mathematics, the use of mathematics and that mathematics can be learned by anyone and can also be studied with fun.

Teachers should appreciate the human side of students who are studying, namely that students were diverse, so that the teacher must be very clever to bridge the diversity. Studying in groups can be a solution, but teachers should not force a student to be in the group that s/he does not like. Teachers must also be able to appreciate the feelings of students and not to scold him/her if s/he is wrong or obtain low achievement. Teachers must ensure that none of the students ridicules other students during the lesson. Teachers should also be able to continuously demonstrate the beauty and usefulness of mathematics so that students will be enthusiastic in learning mathematics.

III. CONCLUSION AND SUGGESTION

Paying attention to the reasons why students are anxious about math lessons and their tests, and noticing a negative relationship between math anxiety and learning achievement, it can be concluded that teachers should be able to design and implement a humanistic learning, i.e. the learning process that humanize humans. In essence, to be able to manage the anxiety students well, a teacher must be ready to give challenge but also ready to provide assistance.

Some tips to math teachers so that the mathematics teaching and learning activities

take place in humanistic ways are: (1) Recognize the advantages and disadvantages of each student, for both cognitive and affective aspects; (2) Prepare a learning scenario that allows all students to be engaged in learning activities; (3) Treat students as human beings. Never make students shy in front of the other students. Also, never humiliate the students; (4) Bring yourself to all students. Build good and harmonious teacher-student relations as well as student-student relations; (5) From time to time, give students the opportunity to make mistakes and learn from those mistakes; (6) Always be prepared to provide assistance at the right time and to the right target.

To make students comfortable in learning mathematics, it is recommended to the teachers of mathematics to always: (1) Demonstrate the beauty of mathematics; (2) Highlight usefulness of mathematics; (3) Emphasize that mathematics can be learned by anyone and that learning mathematics is fun.

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